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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This document provides guidance and procedures for planning and conducting performance tests on airborne radar systems. The document addressed the following radar systems: (1) Weather, (2) Terrain Avoidance, and (3) Airborne Transponders. It provides the test project officer with general information and guidance in test [illegible]ation, test controls, test implementation/conduct and data reduction.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-105
*Test Operations Procedure 6-3-223 27 March 1981
AD No

# FUNCTIONAL TESTING AIRBORNE RADARS



1. SCOPE. This TOP establishes procedures and provides guidance for the functional testing of aircraft airborne radar equipment. Radar equipment, in the context of this TOP, includes airborne transponders, terrain avoidance radar, including surveillance/ground mapping, and weather radar. Functional testing implies the test item is properly installed and calibrated into the designated aircraft and evaluated throughout the operational range of the aircraft mission scenario. The primary objectives of the functional test are: (1) To determine if the radar equipment under test performs its intended function in accordance with the requirements presented in the applicable approved documents; Letter of Requirements (LR), Letter of Agreement (LOA), Required Operational Characteristics (ROC), Materiel Needs (MN), etc., as reflected in the test directive and/or test request; (2) To evaluate the human factors engineering (HFE) functional characteristics; (3) To evaluate the installation and operational compatibility of the aircraft interface, subsystems, and other instrumentation and equipment; and (4) To evaluate the total overall Value Engineering aspects of the system.

*This TOP supersedes MTP 6-3-126, 19 Mar 71; MTP 6-3-295, 21 Oct 70; and MTP 6-3-223, 9 Sep 70.

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## 2. FACILITIES, EQUIPMENT, INSTRUMENTATION, AND SUPPORT REQUIREMENTS.

Functional developmental testing of airborne radars will be accomplished within the operational environment of the designated aircraft and in accordance with standard Army maintenance guidelines and procedures established for the radar equipment under test. Facilities, equipment, instrumentation, and support requirements to support the developmental test should be defined in the test directive or the maintenance support plan (MSP); however, if these data are not defined, the following should be addressed as a minimum to support the test:

### 2.1 Facility.

| CHARACTERISTICS | MINIMUM REQUIREMENTS |
|---|---|
| Operational airfield | As required to support test aircraft. |
| Radar facility | Capable of receiving and interrogating the airborne radar equipment. |
| Test range | Providing man-made and natural terrain obstacles as appropriate. |
| Radar equipped weather facility | In area of high probability of inclement and severe weather as appropriate. |
| Airspace | As appropriate to conduct test. |
| Maintenance support | As required to support aircraft and test equipment. |
| Instrumentation/avionics facility | As required to support test. |
| Data reduction facility | As required to support data reduction and analysis plan. |

### 2.2 Equipment.

| | |
|---|---|
| Maintenance support | Standard Army tool set. |
| Photographic/Video | Color camera (motion, still) as required. |
| Appropriate aircraft and aircraft support equipment | As required. |

| CHARACTERISTICS | MINIMUM REQUIREMENTS |
|---|---|
| Meteorological equipment | As required. |
| Equipment required by referenced TOP's | As required. |

2.3 Instrumentation. As required.

2.4 Support Requirements.

2.4.1 Personnel.

| | |
|---|---|
| Photographic/Video | As required. |
| Instrumentation | As required. |
| Data reduction | As required. |
| Maintenance | As required. |
| Pilots | As required. |
| Human Factors Engineer | As required. |



2.4.2 References.

a. Army Regulation 70-10, Test and Evaluation During Development and Acquisition of Materiel.

b. Army Regulation 385-16, System Safety.

c. AMC Regulation 700-38, w/TECOM Supplement 1 and USAAVNDTA Supplement 1, Test and Evaluation -- Incidents Disclosed During Materiel Testing.

d. DARCOM Regulation 70-8, w/TECOM Supplement 1, DARCOM Value Engineering Program.

e. AMC Regulation 385-12, w/TECOM Supplement 1, Life Cycle Verification of Materiel Safety.

f. TECOM Regulation 70-23, Research and Development: Equipment Performance Reports (EPR's).

g. TECOM Regulation 108-2, Audio Visual Services; Administrative and Technical Procedures, as implemented by USAAVNDTA Memo 108-1.

h. MIL-C-55163, Calibration of Test and Measuring Equipment.

i. MIL-H-46855, Human Engineering Requirements for Military Systems, Equipment, and Facilities.

j. MIL-S-1472, Human Engineering Design Criteria for Military Systems, Equipment, and Facilities.

k. TM 55-411, Maintenance Quality Control and Technical Inspection Guide for Army Aircraft.

l. TOP 6-1-013, Absolute Altimeters.

m. TOP 6-2-235, Rate of Climb Indicators.

n. TOP 7-3-058, Built-In Test Equipment.

o. TOP 7-3-059, Diagnostic and Inspection Equipment (Aviation).

p. TOP 7-3-519, Photographic Coverage.

q. TOP 7-3-530, Vulnerability and Security (Aviation Materiel).

r. Requirements documents (LR, LOA, ROC, Materiel Needs, etc.).

3. PREPARATION FOR TEST. This section provides guidance for planning a functional developmental test of airborne radar equipment. Consummate the planning phase with the detailed test plan. The test plan will establish the test methodology and provide the procedures for gathering, reducing and analyzing data to accommodate each developmental test objective. The test plan will also identify all facility, instrumentation equipment, and support requirements including any specialized training requirements. Follow the appropriate test planning steps as outlined below to insure adequate test controls and a complete, thorough, and cost-effective test.

3.1 Review. Review all pertinent data related to the materiel development test.

a. Requirements documents (LR, LOA, ROC, Materiel Needs, etc.).

b. TECOM IEP/TDP.

c. Applicable materiel available from the procuring agency or developer/contractor such as contractor test plan, contract specification, or military specification.

d. Pertinent reports on previous tests of similar equipment.

e. Any other applicable source of information (AR's, TOP's, TM, etc.).

3.2 Test Objective. Establish the overall test objectives, as outlined in the TECOM test directive (IEP/TDP). Review the requirements documents for developmental criteria and establish appropriate subtest objectives such as:

a. Initial Inspection. Determine the condition and completeness of the airborne radar system in accordance with TOP 7-3-503.[1]* Perform the following as a minimum:

(1) An inventory check against the basic issue item list (BIL). Submit an equipment performance report for any discrepancies in accordance with reference 2.4.2f.

(2) Remove all protective coverings and preservatives, and inspect for defects.

(3) Check for completeness of assembly.

(4) Examine the maintenance support package for completeness, discrepancies, or defects.

b. Physical Characteristics. Determine the physical characteristics of the airborne radar equipment in accordance with TOP 7-3-500.[2] Perform the following as a minimum:

(1) Photograph as appropriate and note the legibility and effectiveness of the radar equipment's legends, markings, etc.

(2) Determine the physical dimensions, weight, and volume of all subsystem components.

(3) Determine the weight volume of the total system.

c. Installation Characteristics. Determine the installation/removal characteristics of the airborne radar equipment in accordance with TOP 7-3-502.[3] Perform the following as a minimum:

(1) Evaluate the installation instructions for accuracy and completeness.

(2) Evaluate the installation technique and mounting provisions to protect the airborne radar equipment against shock and vibrations, as applicable.

(3) Evaluate all subsystem, system, or equipment interfaces (plugs, cables, connectors, etc.) for positive response and secure locking.

(4) Evaluate the system/component installation characteristics for ease and quickness. Assess the following:

*Footnote numbers match reference numbers in Appendix C.

(a) Accessibility.

(b) Mounting flexibility.

(c) Quick disconnect design.

d. Compatibility. Determine if the airborne radar system is compatible with each aircraft for which it was designed, compatible with the mission objective of the designated aircraft, and compatible with all other instruments and equipment on the designated aircraft. Do this in accordance with the compatibility TOP 7-3-509.[4]

e. Performance Test. Determine the adequacy and suitability of the airborne radar equipment to perform its intended function in all applicable operational environments and flight modes in which the designated aircraft is expected to perform. Follow the testing procedures as presented in paragraph 5, Performance Test, this TOP. Pay particular attention to the lighting and HFE considerations. If instrumentation of the aircraft is required to verify the performance sensitivity of the test equipment, see TOP 6-3-526.[5]

f. Reliability, Availability, and Maintainability (RAM). Evaluate the RAM characteristics of the airborne radar equipment in accordance with TOP 7-3-507[6] and TOP 7-3-508.[7]

g. Technical Manuals. Determine the adequacy of the technical manuals in accordance with TOP 1-2-609.[8]

h. Personnel Training. Assess the scope of training required to efficiently operate and use the airborne radar equipment under all aircraft flight environments in the designated aircraft mission scenario. Assess any maintenance training required to maintain the equipment. (See TOP 7-3-501.)[9]

i. Human Factors and Lighting Characteristics. Assess the airborne radar equipment for readability characteristics and for a positive response reaction to the data displayed. See TOP 1-2-610[10] and TOP 7-3-527.[11]

j. Safety. Identify and evaluate any characteristic of the airborne radar equipment instrument which could lead to a flight safety consideration. Such a condition could result from insufficient or extraneous information as well as critical information grouping/layout or display technique. Insure that all failure modes are fail-safe (see TOP 7-3-506).[12]

3.3 Schedule. Prepare a detailed test time line depicting each test associated event which must occur to accomplish the test objectives and to insure facilities, logistics, personnel, and support equipment are available in a time frame conducive to accomplishing a comprehensive and cost-effective test. The time line should show sufficient time periods allotted to accomplish each test objective, insuring that adequate amounts of test data are taken to project required statistical confidences to the test results. The following schedule items should be addressed as a minimum:

a. Facility. Schedule the applicable facility requirements presented in section 2.1. Facility requirements associated with adverse flight conditions due to meteorological environmental considerations should not be overlooked. Flights at night and, in particular, under instrument meteorological conditions (IMC), place the greatest demand on the airborne radar equipment.

b. Instrumentation Equipment and Support. Schedule, as applicable, instrumentation support test equipment and support requirements as presented in sections 2.2, 2.3, and 2.4.

c. Logistics. Schedule logistics requirements, as appropriate, including ground handling equipment, administrative transportation of both personnel and equipment, aircraft fueling, and other servicing accommodations.

3.4 Plan of Test. Develop a detailed test plan in accordance with TECOM Regulation 70-24.[13] This plan will provide the test data requirements and the data collection procedures to satisfy each test objective.

3.5 Test Safety. Assess any potential safety consideration for test and operations personnel and equipment, including microwave and ionizing radiation hazards. Take appropriate steps (training, safety checklist, posters, etc.) to insure that the safety measures are observed throughout the test. Acquire any test safety releases, as required.

3.6 Environmental Impact. Determine if there are any environmental considerations. If environmental considerations exist, develop procedures or outline precautions to be observed to protect the environment.

3.7 Security. Security safeguards for the United States Government and for proprietary rights of the test materiel developer must be considered early in the test planning stage. The following steps must be taken:

a. Consult the security classification guide for the project, as appropriate.

b. Consult the primary test agency security representative for security guidance. Coordinate with security personnel of other test support agencies (developer) and industry, as appropriate.

c. Take appropriate security measures throughout the test to safeguard intra-industry proprietary rights and to safeguard the security of Government property.

4. TEST CONTROLS. The developmental airborne radar test will be conducted and test data will be recorded in strict compliance with the TECOM test directive (IEP/TDP). If specific directions are not available, the following guidelines will prevail:

a. Reduce measurements to universal metric and English units.

b. Round out numerical observations to the nearest tenth.

c. Report time to the nearest hundredth of an hour.

d. Accomplish and record physical characteristics in compliance with TOP 7-3-500.[14]

e. Instrumentation and test equipment must be properly calibrated and have a current calibration certificate.

f. Conduct all tests and collect data in compliance with prescribed and/or standard procedures and when deviations are required, coordinate with the TECOM Project Officer; justification will be documented.

g. Record and process all data in a timely fashion.

h. Assign only properly trained and qualified personnel to participate in the conduct of the test. In particular, pilot qualifications/capability must reflect the expertise necessary to fly the test flight profiles with precision and safety.

i. Conduct the functional airborne radar test in a test environment representative of the operational environment intended for its use.

j. Conduct each test run under documented conditions, such that the test results could be duplicated or compared.

k. Follow the detailed test plan; document any deviations from same. Avoid nonessential test delay due to aircraft scheduled maintenance. This can be accomplished through coordination and planning.

5. FUNCTIONAL PERFORMANCE TESTS. The objective of this subtest is to outline a series of engineering test procedures which can be used to determine the operational range, acuity, and accuracy of the airborne radar equipment in the aircraft flight environment. The conduct of this subtest will be performed in compliance with the TECOM test directive (IEP/TDP). However, if specific guidance is not available, the following general guidance and specific test methodology will be used to evaluate the functional performance of the airborne radar.

5.1 General Guidance. General guidance establishes certain test procedures common to the functional performance testing of each airborne radar system within the scope of this TOP.

a. Determine specific functional characteristics from the test criteria that the test item (development airborne radar) must demonstrate in the operational environment.

b. In accordance with the IEP/TDP requirements, prepare an aircraft flight profile reflecting specific flight modes and characteristics which will exercise each functional characteristic of the airborne radar.

c. Install, check out, and calibrate the developmental radar equipment in accordance with the installation instructions. Insure input and output signals are within specified limits and that no operational hazards exist, including safety hazards due to radiated electromagnetic energy.

d. Install, check out, and calibrate test instrumentation as required to record test flight data. Photographs, motion picture, and/or magnetic tape recordings are conventional methods of collecting performance data for comparison and validation purposes.

e. Calibrate all test equipment and instrumentation in accordance with TECOM Supplement 1 to AR 750-25.[15]

f. Insure local radar and meteorological ground support is available during all flight test phases, as required.

g. Insure adequate data are recorded during each flight to provide credibility as to the accuracy or discrepancy of the test radar equipment. Subjective interpretations of flight conditions by qualified observers and independent output of certified radar equipment of known characteristics and accuracy will be used to evaluate performance.

h. Perform an equipment calibration check and functional test prior to each test flight and record the following information:

(1) Test run and sequence number description.

(2) Test item nomenclature and serial number.

(3) Functional characteristic of the radar equipment to be evaluated during the particular test run.

(4) Results of equipment calibration check and functional test.

i. Fly the predetermined flight profile using the test radar equipment as the primary flight instrument. Record pertinent flight, meteorological, and radar equipment performance data as required.

5.2 Weather Radar.

5.2.1 Test Conduct. Perform the following, using aircraft equipped with the test radar equipment.

a. Check the initial serviceability of the test equipment in accordance with applicable technical publications.

b. Coordinate each test run with local and national weather advisory services to maximize test exposure and safety.

c. Conduct the flight test in a storm area serviced by a long-range ground based weather radar. Test objectives, flight profiles, and storm penetration intentions should be coordinated with the appropriate ground radar personnel. Flight personnel and ground support personnel must have a thorough and mutual understanding of weather severity or intensity classification and the meteorological conditions characteristic to them. Aircraft and pilot limitations must be addressed.

5.2.2 Operational Characteristics. Verify the following technical properties of the test radar equipment, as appropriate:

a. Power requirements -- verify the electrical power requirements of the radar system. Insure that all requirements are satisfied by the electrical systems of the aircraft on which the test radar is installed, and that the radar equipment power requirements do not exceed the allowable limits.

b. Controls, adjustments, and indicators (mechanical and electrical).

(1) For each control, adjustment, and indicator, determine the following, as appropriate.

(a) Operation is correct.

(b) Effect on the system is as required.

(c) Absence of binding and rubbing.

(d) Calibration is proper.

(e) Changes are monitored and displayed correctly.

(f) Range is correct.

(2) List any discrepancies.

(3) Evaluation of devices requiring flight conditions will be checked during the operation and performance demonstration flights.

c. Equipment safety and protective devices -- verify proper operation of each.

d. Fail-safe characteristics -- evaluate the system for the following:

(1) Internal failure -- when the system becomes inoperative because of an internal failure, operator personnel shall be made aware of the condition. Simulate failures and verify indication.

(2) Acceptance or provision of external signals -- if the system accepts/provides electrical signals from/to other on-board avionics equipment, operator personnel shall be made aware of any out of limit level existing on any line. Simulate failures on each line and check for indication.

e. Confidence, self-checking or integrity circuits -- if any, verify proper operation.

f. Primary technical characteristics -- measure receiver sensitivity and transmitter power versus frequency (at selected points distributed across the operating frequency range, if applicable).

g. Cold start and warm-up -- subject the system to a minimum of three consecutive cold start power application procedures. Determine warm-up time and effect due to multiple power applications.

5.2.3 Performance Test. Perform the following:

a. Fly the test item equipped aircraft to the storm area. Note: The storm area must be evaluated to determine, as applicable, if weather conditions exist conducive to test conditions which will not exceed the restrictions established by Army regulation and/or those established in the applicable aircraft operator's manual.

b. Perform storm avoidance procedures using, where possible, both the techniques of circumnavigation and frontal penetration.

c. While conducting the procedures for storm avoidance, evaluate the performance of the test item by utilizing all controls, features, displays, etc., of the system. The emphasis during these procedures shall be on determining the degree to which the system obtains and provides to operator personnel accurate information concerning the characteristics of the storm. Test personnel shall use photographic techniques, both on the system displays and on the storm system, as noted by visual means. If practical, verification of the storm intensity and aircraft position in reference to the storm will be determined, using photographic techniques. Two-way voice communication between the aircraft and ground weather radar station will be recorded. A time base record of each flight will be kept and correlated to ground activities. The following procedures shall be included in the evaluation:

(1) On straight line approaches to the storm area, photograph the display for various displayed ranges from maximum to minimum.

(2) In good operating range, for various settings of controls, determine best definition, etc. (video, R. F. and background controls).

(3) On straight line approaches, for various tilt settings of the antenna, analyze information from displays concerning vertical development.

(4) Evaluate contouring ISO ECHO circuitry when the display indicates extreme turbulence.

(5) Where a localized storm area exists, use approaches at various angles; with and without contouring determine radar penetration and effect of the angle of approach.

(6) Where antenna stabilization (for pitch and roll) is provided, perform a straight line approach and photograph the display for small induced rolls and pitches.

(7) Utilize various airspeeds to determine range closing display accuracy.

5.2.3.1 Effects of Atmospheric Conditions. Perform selected procedures of paragraph 5.2.3 during periods when changes in atmospheric conditions exist to determine the effects on performance characteristics, e.g., day/night display controls and characteristics. These periods and/or conditions shall include:

a. Night hours.

b. Hours at sunrise and sunset.

c. High and low temperatures and high altitude.

5.2.4 Durability. On completion of the operation and performance tests, the durability characteristics of the system will be examined. Perform the following:

a. A visual inspection with consideration given to the following:

(1) Loose chassis components.

(2) Loose or missing hardware.

(3) Broken fasteners or seams.

(4) Discoloration due to heat effects, rust, or corrosion.

(5) Loose panel components.

(6) Loose connectors or cables.

For each defect, the nature and location shall be noted.

b. A remeasurement of primary technical characteristics to determine any degradation (transmitting power, receiver sensitivity).

5.2.5 Data Required. In accordance with the IEP/TDP requirements, record and time correlate the following:

a. Flight profile information to include test run sequence number and profile description.

b. Meteorological conditions during each test run; i.e., temperature, relative humidity, atmospheric pressure, windspeed and direction, precipitation, and other characteristics, at pertinent altitudes.

c. Test engineering data:

(1) Flight performance data, airspeed, altitude, attitude, rate of climb/descent, and bank angle.

(2) Time marked to a known reference.

(3) Photographic data.

(4) Aircraft to ground transmissions.

(5) Radar performance data.

d. Subjective data.

5.3 Terrain Avoidance Radar. Terrain avoidance equipment is utilized on Army aircraft to allow low altitude flight in the presence of natural and man-made obstructions. This TOP assesses the ability of the equipment to obtain and display to operating personnel accurate information concerning the location, size, and range of obstruction hazards to low flying high speed aircraft.

5.3.1 Operational Characteristics. In accordance with the data requirements of the IEP/TDP, verify the following technical properties of the test radar equipment, as appropriate.

a. Power Requirements -- verify the electrical power requirements of the radar system. Insure that all requirements are satisfied by the electrical systems of the aircraft on which the test radar is installed and that the radar equipment power requirements do not exceed the allowable limits.

b. Controls, adjustments, and indicators (mechanical and electrical).

(1) For each control, adjustment, and indicator determine the following, as appropriate.

(a) Operation is correct.

(b) Effect on the system is as required.

(c) Absence of binding and rubbing.

(d) Calibration is proper.

(e) Changes are monitored and displayed correctly.

(f) Range is correct.

(2) List any discrepancies.

(3) Evaluation of devices requiring flight conditions will be checked during the operation and performance test.

c. Equipment safety and protective devices -- verify proper operation of each.

d. Fail-safe characteristics -- evaluate the system for the following:

(1) Internal failure -- when the system becomes inoperative because of an internal failure, operator personnel shall be made aware of the condition. Simulate failures and verify indication.

(2) Acceptance or provision of external signals -- if the system accepts/

provides electrical signals from/to other on-board avionics equipment, operator personnel shall be made aware of any out of limit level existing on any line. Simulate failures on each line and check for indication.

e. Confidence, self checking or integrity circuits -- if any, verify proper operation.

f. Primary technical characteristics -- measure receiver sensitivity and transmitter power versus frequency (at selected points distributed across the operating frequency range, if applicable).

g. Cold start and warm-up -- subject the system to a minimum of three consecutive cold start power application procedures. Determine warm-up time and effects due to multiple power applications.

5.3.2 Performance Test. The system shall be checked for proper operation in all modes for which it is designed. Particular attention shall be given to data that evidences false indications, instabilities, inaccuracies, and drifting. The tests will be divided into categories so that they provide a sequence for logical evaluation of system properties under increasingly complex flight procedures including surveillance/mapping requirements and culminating in a simulated tactical mission. Emphasis shall be placed on evaluating the usefulness and precision of the system for tactical employment of the aircraft in both manual and automatic modes of operation. Conditions will necessarily vary for each test; however, the following general conditions shall be observed and/or performed.

a. Tests shall be conducted utilizing appropriate type aircraft equipped with auxiliary systems required for testing the terrain avoidance set.

b. During all flights, the aircraft will have two crewmen whose description and responsibilities are given by the following:

(1) Subject Pilot -- occupies "first pilot" seat of aircraft, is hooded to simulate IFR conditions during automatic and manual modes of test, flies aircraft using the information provided by the terrain avoidance system and standard aircraft flight instruments.

(2) Project Test Officer -- occupies copilot seat of aircraft; maintains visual contact with terrain; monitors actions of subject pilot; records time, equipment settings, and photographs displays; and prevents the aircraft from entering a dangerous situation.

c. Conduct tests under optimum visual meteorological conditions bearing in mind that only one pilot will be looking outside acting as safety pilot during some portions of the test.

d. Establish a radio communication network between all aircraft and ground sites involved.

e. Altitudes and velocities utilized during the tests shall be selected on the basis of performance limits for both the aircraft utilized and the system's known capabilities.

f. All systems and other on-board electronics associated with the test system shall receive a complete ground operational check prior to flight.

5.3.2.1 Target Detection and Resolution. In accordance with the IEP/TDP requirements, determine the ability of the system to detect, resolve, and adequately display targets of various sizes, shapes, and separation by using the following methods:

a. Both crewmen observe VFR.

b. Operate the system in manual mode.

c. Fly a constant barometric altitude.

d. Make approaches to various targets which are of varying size, vertical and horizontal dimensions, material composition, etc., starting beyond the system's maximum range and utilizing a navigation system to progress to the target destination. Over-fly the target a sufficient distance to note display indications during passage.

e. Utilize photographic recording of visual displays at various landmark distances inbound to the target to document the system's performance. Utilizing existing or artificial targets (tethered balloons, etc.), note in particular the following system operational characteristics for the following cases:

Case (1) Single targets of various size and shapes

-- Acquisition distance

-- Outline definition

-- Altitude flown

-- Clearance altitude set

Case (2) Multiple targets with vertical separation

-- Acquisition distance

-- Distance at which vertical separation of targets occur (vertical resolution)

-- Altitude flown

-- Clearance altitude set

Case (3) Multiple targets with horizontal separation

-- Acquisition distance

-- Distance at which horizontal separation of target occurs (azimuth resolution)

-- Altitude flown

-- Clearance altitude set

5.3.2.2 Operating Modes Tests. In accordance with the IEP/TDP requirements, test the system in each of its operating modes utilizing each mode in first a manual and then in an automatic manner. Manual operation will be utilized to determine the capability of the system to provide the information required by the pilot to safely direct the aircraft. Modes which provide for profile following, vertical clearance, lateral clearance, and combination modes will be checked where applicable. Perform the following:

a. Select an appropriate test course containing terrain obstacles which will allow evaluation of each mode.

b. At various clearance altitudes and speeds, fly manual and then automatic in each mode.

c. Use a navigation system to determine distances and destination coordinates.

d. Evaluate during each of the flights the following system characteristics.

(1) Ability to automatically control or provide information for manual control.

(2) Ability to maintain desired altitude and track.

(3) Adequacy of warning and display devices.

5.3.2.3 Ground Mapping. In accordance with the IEP/TDP requirements, evaluate the system, where the capability exists, for use of the ground mapping surveillance mode as an aid to navigation or as a method for updating navigation systems. See section 5.4 for test methodology.

5.3.2.4 Simulated Tactical Mission. In accordance with the IEP/TDP requirements, evaluate the ability of the system to enhance the employment of the aircraft in tactical missions such as a surveillance operation. Perform the following:

a. Arrange a test course with rugged and heavily wooded terrain containing a target destination identified as the location to be surveyed.

b. Program a flight plan which uses an approach to the location which affords maximum opportunity for utilization of terrain for concealment against either visual or radar detection.

c. The course should be provided with a target acquisition radar or personnel equipped with optical observation devices.

d. Measure the effectiveness of the system by conducting flight approaches in the following manner:

(1) Aircraft without avoidance system flown VFR.

(2) Aircraft equipped with system but flown VFR utilizing display data provided by the system.

(3) Aircraft equipped with system and flown in appropriate automatic modes.

e. Observations of the test-bed aircraft will be reported by both visual and radar personnel; reports will include the length of each observation.

f. Compare the concealment capabilities of the system using the number and duration of sighting for each of the different flight methods of section d.

g. Repeat flights in each of the various manners utilizing different pilots so that the effect of pilot capability can be minimized.

5.3.2.5 Effects of Atmospheric Conditions. In accordance with the IEP/TDP requirements, selected performance procedures shall be accomplished during periods when changes in atmospheric conditions exist to determine the effects these changes have on transmissions, reception, day/night displays, and other performance characteristics. These periods and/or conditions will include:

a. Night hours.

b. Hours at sunrise and sunset.

c. Adverse weather conditions, poor visibility (rain, fog).

d. High and low temperatures.

e. Operation to the maximum operative altitude of the equipment.

5.3.3 Durability. In accordance with the IEP/TDP requirements, on completion of the operation and performance tests, the durability characteristics of the system will be examined. Perform the following:

a. A visual inspection with consideration given to the following:

(1) Loose chassis components.

(2) Loose or missing hardware.

(3) Broken fasteners or seams.

(4) Discoloration due to heat effects, rust, or corrosion.

(5) Loose panel components.

(6) Loose connectors or cables.

For each defect, the nature and location shall be noted.

b. A remeasurement of primary technical characteristics to determine any degradation (transmitter power, receiver sensitivity).

5.3.4 Data Required. Record and time correlate the following:

a. Flight profile information to include test run sequence number and profile description.

b. Meteorological condition during each test run, i.e., temperature, relative humidity, atmospheric pressure, wind speed and direction, precipitation, and other characteristics at pertinent altitudes.

5.4 Surveillance/Mapping Radars. Surveillance/mapping radar coverage in this section will be limited to area mapping as an aid to flight navigation. Other applications such as weather avoidance and terrain warning are covered in sections 5.2 and 5.3 respectively, and should be tested accordingly. To be tested is the ability of the equipment to obtain and display to operating personnel an accurate map of geographic information useful in precision cross-country navigation and approach to landings.

5.4.1 Operational Characteristics. In accordance with the data requirements of the IEP/TDP, verify the following technical properties of the test radar equipment, as appropriate:

a. Power requirements -- verify the electrical power requirements of the radar system. Insure that all requirements are satisfied by the electrical systems of the aircraft, on which the test radar is installed, and that the radar equipment power requirements do not exceed the allowable limits.

b. Controls, adjustments, and indicators (mechanical and electrical).

(1) For each control, adjustment, and indicator determine the following, as appropriate.

(a) Operation is correct.

(b) Effect on the system is as required.

(c) Absence of binding and rubbing.

(d) Calibration is proper.

(e) Changes are monitored and displayed correctly.

(f) Range is correct.

(2) List any discrepancies.

(3) Evaluation of devices requiring flight conditions will be checked during the operation and performance test.

c. Equipment safety and protective devices -- verify proper operation of each.

d. Fail-safe characteristics -- evaluate the system for the following:

(1) Internal failure -- when the system becomes inoperative because of an internal failure, operator personnel shall be made aware of the condition. Simulate failures and verify indication.

(2) Acceptance or provision of external signals -- if the system accepts/provides electrical signals from/to other on-board avionics equipment, operator personnel shall be made aware of any out of limit level existing on any line. Simulate failures on each line and check for indication.

e. Confidence, self checking or integrity circuits -- if any, verify proper operation.

f. Primary technical characteristics -- measure receiver sensitivity and transmitter power.

g. Cold start and warm-up -- subject the system to a minimum of three consecutive cold start power application procedures. Determine warm-up time and effects due to multiple power applications.

5.4.2 Performance Test. The system shall be checked for proper operation in all modes for which it is designed. Particular attention shall be given to data that evidences poor resolution, instabilities, inaccuracies, and drifting. The tests will be divided into categories so that they provide a sequence for logical evaluation of system properties under increasingly complex flight procedures culminating in a simulated tactical mission. Emphasis shall be placed on evaluating the usefulness and precision of the system for tactical employment of the aircraft. Conditions will necessarily vary for each test; however, the following general conditions shall be observed and/or performed:

a. Tests shall be conducted utilizing appropriate type aircraft equipped with auxiliary systems required for testing the subject equipment.

b. During all flights, the aircraft will have as a minimum two crewmen whose description and responsibilities are given by the following:

(1) Subject Pilot -- occupies "first pilot" seat of aircraft; is hooded as required to simulate IFR conditions during test; flies aircraft using the information provided by the surveillance/mapping system and standard aircraft flight instruments.

(2) Project Test Officer -- occupies copilot seat of aircraft; maintains visual contact with terrain; monitors actions of subject pilot; records time, equipment settings, and photographs displays; and prevents the aircraft from entering a dangerous situation.

c. Conduct tests under optimum visual meteorological conditions during simulated IFR flight to enhance maximum safety.

d. Establish a radio communication network between all aircraft and ground sites involved.

e. Select altitudes and velocities during the tests on the basis of the performance limits for the aircraft utilized and the test system's known capabilities.

f. All systems and other on-board electronics associated with the test system shall receive a complete ground operational check prior to flight.

5.4.2.1 Target Detection and Resolution. In accordance with the IEP/TDP requirements, determine the ability of the system to detect, resolve, and adequately display ground targets of various sizes, shapes, and separation by using the following methods:

a. Both crewmen observe and compare test system display to ground features during VFR flight. Photograph display and ground feature for a permanent record.

b. Fly simulated tactical missions over prescribed well mapped courses under simulated IFR conditions, using the test system as the primary navigational aid.

c. Make approaches to various targets which are of varying size, shapes, material composition, etc., starting beyond the system's maximum range and progressing over the target destination area. Over-fly the target at various altitudes consistent with the operational range presented in the test system specifications. Note and photograph display indications during passage. Utilizing photographic recording of the visual display, note in particular the following operational characteristics for the following cases:

Case (1) Single targets of various size and shapes.

-- Acquisition distance

-- Outline definition

-- Altitude flown

-- Loss distance

Case (2) Multiple targets with horizontal separation.

-- Acquisition distance

-- Distance at which horizontal separation of target occurs (azimuth resolution)

-- Altitude flown

-- Loss distance

5.4.2.2 Ground Mapping. In accordance with the IEP/TDP requirements, evaluate the system for use in the ground mapping mode as an aid to navigation or as

a method for updating navigation aids. Perform the following:

a. Select a test course for which accurate data (geographic map and visual landmarks) are available. The course should include where possible:

(1) Rugged terrain, hills, etc.

(2) Bodies of water.

(3) Water-land transitions and vice versa.

(4) Flat and wooded areas.

(5) Populated areas with buildings.

(6) Large singular structures, vehicles, etc.

b. Fly the course at differing constant altitudes starting at the maximum altitude as presented in the test system specifications. Reduce the altitude, if practical, for each successive flight until a minimum safe altitude is reached.

c. The subject pilot shall fly VFR and the project test officer shall photograph displays at regular intervals over the course, in particular when flying over outstanding landmaks. Compare the displays with map and photographs of the subject areas.

5.4.2.3 Simulated Tactical Mission. In accordance with the stated mission scenario and the IEP/TDP requirements, evaluate the ability of the system to enhance the employment of the aircraft in tactical missions such as a surveillance operation. Perform the following:

a. Arrange a test area which is well mapped and photographed. The test area should contain outstanding landmarks of varying size and shapes and materiel composition as well as rugged and heavily wooded terrain. Designate geographic locations within the test area to be surveyed.

b. Program multiple flight plans to the survey locations providing maximum utilization of the test system. Fly various altitudes from 5,000 feet down to 50 feet above the highest obstacle in the test area.

c. Execute the flight plans under simulated IFR to the survey locations. Identify the target location and photograph. Verify target acquisition via visual observation. Observe and record all difficulties encountered.

d. Deviation from flight plan. Perform the following:

(1) Turn off the test system.

(2) Disorient the hooded pilot through a series of turns and level flight as directed by the observer.

(3) Activate the test system.

(4) Determine if the hooded pilot can return to the target area or home base utilizing the test equipment. Observe and record all difficulties encountered.

e. Set up and execute a landing approach to a target area, utilizing the test equipment. Observe and record any difficulty encountered.

f. Repeat each of the various flight profiles using different pilots to determine system effectiveness versus pilot experience and capability.

5.4.2.4 Effects of Atmospheric Condition. In accordance with the IEP/TDP requirements, selected performance procedures shall be accomplished during periods when changes in atmospheric conditions exist to determine the effects these changes have on system performance characteristics such as resolution, stability, and accuracy. Determine any degradation in the system performance due to the day/night cycle. The following adverse operating conditions must be considered:

a. Night hours.

b. Hours at sunrise and sunset.

c. Adverse weather conditions, poor visibility (rain, fog).

d. High and low temperatures.

e. Operation to the maximum operative altitude of the equipment.

5.4.3 Durability. In accordance with the IEP/TDP requirements, on completion of the operation and performance tests, the durability characteristics of the system will be examined. Perform the following:

a. A visual inspection with consideration given to the following:

(1) Loose chassis components.

(2) Loose or missing hardware.

(3) Broken fasteners or seams.

(4) Discoloration due to heat effects, rust, or corrosion.

(5) Loose panel components.

(6) Loose connectors or cables.

For each defect, the nature and location shall be noted.

b. A remeasurement of primary technical characteristics to determine any degradation (transmitter power, receiver sensitivity).

5.4.4 Data Required. Record and time correlate the following:

a. Flight profile information to include test run sequence number and profile description.

b. Meteorological condition during each test run, i.e., temperature, relative humidity, atmospheric pressure, wind speed and direction, precipitation, and other characteristics, at pertinent altitudes.

c. Test engineering data:

(1) Flight performance data; airspeed, altitude, attitude, rate of climb/descent, and bank angle.

(2) Time marked to known reference.

(3) Photographic data.

(4) Aircraft to ground transmissions.

(5) Radar performance data.

d. Subjective data.

5.5 Airborne Transponders (IFF and/or Air Traffic Control).

5.5.1 Discussion.

a. Airborne transponders provide a secondary radar target which differs from the primary radar target in that it is not a reflected signal from the ground radar transmitter but a "reflected" transmission from the transponder. This secondary radar target system is based upon three functions carried out jointly by ground and airborne components.

(1) A ground component (interrogator) sends out groups of closely spaced radar pulses from an antenna synchronized with and usually mounted on the radar antenna.

(2) The airborne component (transponder), within receiving range of the interrogator signal and set to the same mode, will be triggered and transmit a reply.

(3) The reply transmitted by the airborne transponder is received by the air traffic control facility, and then displayed on the radar scope.

b. The earliest type of airborne transponder (IFF) was limited to a single mode with changeable codes and used primarily for identification of aircraft as friend or foe. Today, with the heavy increases in air traffic density, more sophisticated equipment with a wider range of capabilities is needed and used. The airborne transponders, when used with designated auxiliary equipment, is able to provide automatic radar identification, identification of position,

emergency signals and altitude reporting of the aircraft on which it is located to all suitably equipped interrogating air traffic control facilities within the operational range of the system. This airborne transponder receives, decodes, and replies to the characteristic interrogations of operational modes 1, 2, 3/A, C and 4. Also available are specially coded identification of position, emergency, and special position pulses which can be transmitted to interrogating air traffic control facilities. Lack of specifically designated auxiliary equipment (minimum configuration) does not prevent operation in modes 1, 2, and 3/A. Interrogation pulses for modes 1, 2, 3/A, C and 4 are transmitted on a frequency of 1030 mHz and are recognized by the transponder through pulse width and spacing. Modes 1, 2, 3/A and C each use two interrogation and one side lobe suppression pulse .8 $\pm$ .1 microseconds wide. The side lobe suppression pulse for the above modes occurs 2$\pm$0.15 microseconds after the leading edge of each initial pulse. Mode 4 interrogation pulse characteristics consist of four pulses 0.5$\pm$.1 microseconds wide, referenced from the leading edge of the first pulse, in multiples of two used. The four pulses may be followed by as many as 32 additional pulses spaced as close as two microseconds. The side lobe suppression pulse for mode 4 is spaced 8$\pm$0.15 microseconds from the leading edge of the first pulse. The transponder reply information is transmitted on a frequency of 1090 mHz between two framing pulses spaced 20.3$\pm$0.5 microseconds. The coded information between the two framing pulses is presented by presence, or absence, of pulses at predetermined spacings. In modes 1, 2 and 3/A the number of information pulses is a function of code dial settings on the transponder. In mode C this information is determined by the altimeter/encoder, and in mode 4 by an external computer. For mode 1 a reply pulse train is transmitted containing from zero to a maximum of five information pulses plus two framing pulses. The information pulse spacing is in multiples of 2.9 $\pm$0.05 microseconds from the initial framing pulse. The position where a sixth pulse would appear (17.4 $\pm$0.05 microseconds from the initial framing pulse) is not used. From the specified five information pulses, a total of 32 different codes are available. For modes 2,3/A, a reply pulse train is transmitted containing from zero to a maximum of 12 information pulses plus two framing pulses. The information pulse spacing is in multiples of 1.45 $\pm$0.05 microseconds from the initial framing pulse. The position where a seventh pulse would appear (10.5 $\pm$0.05 microseconds from the initial framing pulse) is normally not used. From the specified 12 information pulses, a total of 4096 codes are available. For mode C when an altimeter/encoder is connected to the transponder, a reply pulse train is transmitted containing from one to a maximum of 11 information pulses plus two framing pulses. The information pulse spacing is in multiples of 1.45 $\pm$0.05 microseconds from the initial framing pulse. The positions where a seventh pulse (10.15 $\pm$ 0.05 microseconds from initial framing pulse) and a ninth pulse (13.05 $\pm$ 0.05 microseconds from initial framing pulse) would appear are not used. From the specified 11 information pulses, a total of 2048 codes are available. Mode 4 encoding is performed in an external computer.

5.5.2 Operational Characteristics. In accordance with the IEP/TDP requirements, verify the following technical properties of the test radar equipment, as appropriate:

a. Power requirements -- verify the electrical power requirements of the radar system. Insure that all requirements are satisfied by the electrical systems of the aircraft on which the test radar is installed, and that the radar equipment power requirements do not exceed the allowable limits.

b. Controls, adjustments, and indicators (mechanical and electrical).

(1) For each control, adjustment, and indicator determine the following, as appropriate.

(a) Operation is correct.

(b) Effect on the system is as required.

(c) Absence of binding and rubbing.

(d) Calibration is proper.

(e) Changes are monitored and displayed correctly.

(f) Range is correct.

(2) List any discrepancies.

(3) Devices whose evaluation requires flight conditions will be checked during the operation and performance test.

c. Equipment safety and protective devices -- verify proper operation of each.

d. Fail-safe characteristics -- evaluate the system for the following:

(1) Internal failure -- when the system becomes inoperative because of an internal failure, operator personnel shall be made aware of the condition. Simulate failures and verify indication.

(2) Acceptance or provision of external signals -- if the system accepts/provides electrical signals from/to other on-board avionics equipment, operator personnel shall be made aware of any out-of-limit level existing on any line. Simulate failures on each line and check for indication.

e. Confidence, self checking or integrity circuits -- if any, verify proper operation.

f. Primary technical characteristics -- measure receiver sensitivity and transmitter power versus frequency (at selected points distributed across the operating frequency range, if applicable).

g. Cold starts and warm-up -- subject the system to a minimum of three consecutive cold start power application procedures. Determine warm-up time and effects due to multiple power application.

5.5.3 Performance Test. In accordance with the IEP/TDP requirements, evaluate the operational performance of the airborne transponder system as a function of reliable range and frequency accuracy and stability.

a. Reliable Range. Determine the maximum and minimum reliable ranges of the airborne transponder system; use the procedures of TOP 6-3-515 [16] as a guide and proceed as follows:

(1) Establish a two-way communications net between the test bed aircraft and the air traffic controller.

(2) Operate the airborne transponder on normal sensitivity.

(3) Have aircraft proceed from over the air traffic control facility outbound on a cardinal heading. Aircraft altitudes for the purpose of this test will be determined by the selected operational criteria described in applicable ROC, LR, or LOA.

(4) Jointly exercise the airborne transponder system and ground interrogator in the various modes, codes and special operation features while observing the radar scope for maximum range at which loss of signal occurs. In coordination with civil air traffic control facilities, operate the transponder in modes 1, 2, 3/A and C in flight profiles which are both appropriate for the particular test bed Army aircraft being used, and in simulation of civil air traffic on the federal airway system in conditions of instrument flight. In coordination with military air defense facilities operate the transponder in mode 4 in flight profiles appropriate for the (tactical mission) test bed employed. Conduct a minimum of five such flights per test installation per profile. Collect transponder performance data from the ground (interrogation) facility operator.

(5) Have aircraft reverse course and proceed inbound until transponder signals are observed on radarscope. Repeat procedures of 3 and 4 above, observing signal quality in vicinity of air traffic control facility and range at which loss of signal occurs.

(6) On random headings, and at arbitrarily selected ranges, execute 360° turns to determine transponder reliability during the turn maneuver. Conduct the test at gradually increasing ranges to determine the effect of range on reliability and reception.

b. Qualitative Frequency, Accuracy, and Stability. Throughout the period of turn-on, operation and turn-off of the airborne transponder system, perform the applicable procedures of referenced TOP 6-3-514 [17] to determine the qualitative frequency, accuracy, and stability of the system.

5.5.4 Durability. In accordance with the IEP/TDP requirements, on completion of the operation and performance tests, the durability characteristics of the system will be examined. Perform the following:

a. A visual inspection with consideration given to the following:

(1) Loose chassis components.

(2) Loose or missing hardware.

(3) Broken fasteners or seams.

(4) Discoloration due to heat effects, rust, or corrosion.

(5) Loose panel components.

(6) Loose connectors or cables.

For each defect, the nature and location shall be noted.

b. A remeasurement of primary technical characteristics to determine any degradation (transmitter power, receiver sensitivity).

5.5.5 Data Required. In accordance with the IEP/TDP requirements, record and time correlate the following:

a. Flight profile information to include test run sequence number and profile description.

b. Meteorological condition during each test run, i.e., temperature, relative humidity, atmospheric pressure wind speed and direction, precipitation, and other characteristics, at pertinent altitudes.

c. Test engineering data:

(1) Flight performance data; airspeed, altitude, attitude, rate of climb/descent and bank angle.

(2) Time marked to known reference.

(3) Photographic data.

(4) Aircraft to ground transmissions.

(5) Transponder performance data.

(6) Subjective data.

6. DATA REDUCTION AND PRESENTATION. Data reduction/presentation and analyses will be in accordance with the IEP/TDP, DTP Analyses/Plan and TECOM PAM 70-3, R&D Acquisition Project Engineers Handbook, 16 June 1978.

6.1 Data Reduction. Identify, organize, and correlate raw test data as to time, parameter grouping, and test run. As required, convert raw test measurements to engineering units. Analyze the performance data for the aircraft instrument to satisfy the test objectives and determine compliance or noncompliance with the test instrument developmental criterion or specifications.

6.2 Data Presentation.

a. Prepare a narrative document of the test results to include diagram, graphs, photographic, tabular, and other reduced data as required, to support the test conclusions and recommendations. The degree to which the test item satisfies the test criteria or specifications in the operational environment should be clearly evident.

b. In the instance of a total or partial failure of the test item to perform its intended function, assess the implications of the failure and present recommendations as applicable.

Recommended changes to this publication should be forwarded to Commander, US Army Test and Evaluation Command, ATTN: DRSTE-AD-M, Aberdeen Proving Ground, MD 21005. Technical information may be obtained from the preparing activity: Commander, US Army Aviation Development Test Activity, ATTN: STEBG-MP-QA, Fort Rucker, AL 36362. Additional copies are available from the Defense Technical Information Center (DTIC), Cameron Station, Alexandria, VA 22314. This document is identified by the accession number (AD No) printed on the first page.

APPENDIX A-1

PRETEST CHECKLIST

FUNCTIONAL TESTING AIRBORNE RADARS

1. Have facilities, test equipment, instrumentation, and support requirements been scheduled or secured? See paragraphs 2 through 2.4.2, this TOP.

Yes _____ No _____.

2. Has appropriate test planning been accomplished in accordance with paragraphs 3.1 through 3.7, this TOP? Yes _____ No _____.

3. Have test control measures been implemented such that test results could be duplicated or compared? See paragraphs 4a through 4k, this TOP.

Yes _____ No _____.

APPENDIX A-2

POST-TEST CHECKLIST

FUNCTIONAL TESTING AIRBORNE RADAR

1. Have test data been collected, recorded, and presented in accordance with this TOP? Yes _____ No _____ Comment: _____

_____.

2. Were the facilities, test equipment, instrumentation, and support accommodations adequate to accomplish the test objectives? Yes _____ No _____. Comment: _____

_____

3. Have all data collected been reviewed for correctness and completeness? Yes _____ No _____. Comment: _____

_____

4. Were the test results compromised in any way due to insufficient test planning? Yes _____ No _____. Comment: _____

_____

5. Were the test results compromised in any way due to test performance procedures? Yes _____ No _____. Comment: _____

_____

6. Were the test results compromised in any way due to test control procedures? Yes _____ No _____. Comment: _____

_____

7. Were the test results compromised in any way due to data collection, reduction, or presentation technique? Yes _____ No _____. Comment: _____

_____

APPENDIX B

DATA COLLECTION FORM

FUNCTIONAL TESTING AIRBORNE RADAR

SAMPLE

I. Date _____ Aircraft Tail No. _____

II. Test Run Identification _____ Profile No. _____

III. Test Item Identification.

| Nomenclature | Model No. | Serial No. |
|---|---|---|
| | | |

IV. Data Collection Technique. _____

_____

_____

_____

V. Data Parameters Being Recorded.

1.

2.

3.

..

..

VI. Maximum Operational Range (as applicable).

| Slant Range N.M. | Altitude Feet | Operational Utility | | | Comments |
|---|---|---|---|---|---|
| | | Good | Marginal | Not Accept. | |
| | | | | | |

VII. Accuracy (as applicable)

| Obstruction Characteristics | | | | Slant Range Acft to Obstruction N.M. | Acft Altitude MSL ft | Clearance | |
|---|---|---|---|---|---|---|---|
| Type Constr | Size | | Height MSL ft | | | Vertical ft | Horiz ft |
| | Vertical | Horizontal | | | | | |
| | | | | | | | |

Comment: _____

_____

_____

VIII. ANTENNA RADIATION PATTERN DATA SHEET

Type of Antenna Pattern _____ Frequencies (1)_____(2)_____(3)_____
Type of Antenna _____ Location of Antenna _____
Location of Ground Sta. _____ Distance to Ground Sta.____
Location of A/C _____ Flight Altitude _____ Flight Attitude____
Type & No of A/C _____ Type of Ground Equip. Used _____
Type of Airborne Equip. Used _____ Signal Input Atten. (Ref) _____DB
Date _____ Project No _____ Weather _____

| Mag. Heading | DB | Relative Bearing | Remarks |
|---|---|---|---|
| 0 | | | |
| 15 | | | |
| 30 | | | |
| 45 | | | |
| 60 | | | |
| 75 | | | |
| 90 | | | |
| 105 | | | |
| 120 | | | |
| 135 | | | |
| 150 | | | |
| 165 | | | |
| 180 | | | |
| 195 | | | |
| 210 | | | |
| 225 | | | |
| 240 | | | |
| 255 | | | |
| 270 | | | |
| 285 | | | |
| 300 | | | |
| 315 | | | |
| 330 | | | |
| 345 | | | |

Ground Sta. Operator _____

Airborne Sta. Operator _____

IX. Test Run Atmospheric Conditions.

1. Ambient temperature _____.
2. Relative Humidity _____.
3. Atmospheric Pressure _____.
4. Precipitation _____.

X. Observer/Operator Comments Including:

1. Commenter identification _____

Test Responsibility _____

2. Test item utility.
3. Advantages/disadvantages.
4. Operational complexity.

_____

_____

_____

_____

_____

_____

XI. Test Incident Narrative Description Including:

1. Observer/narrator identification _____.
2. Test event time line surrounding incident.
3. Pertinent circumstances surrounding incident.
4. Pertinent environmental, flight, or test parameter changes surrounding the incident.

_____

_____

_____

_____

XII. Test Personnel.

| Name | Title | Test Function | Comments Experience |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |

FOOTNOTE REFERENCES

1. TOP 7-3-503, Arrival Inspection/Pre-Operational Inspection (Aviation Materiel).
2. TOP 7-3-500, Physical Characteristics (Aviation Materiel).
3. TOP 7-3-502, Installation Characteristics.
4. TOP 7-3-509, Compatibility/Related Equipment (Aviation Materiel).
5. TOP 6-3-526, Functional Requirements/Aircraft Test Instrumentation.
6. TOP 7-3-507, Maintenance (Maintainability, Availability)
7. TOP 7-3-508, Reliability (Aviation Materiel)
8. TOP 1-2-609, Instructional Material Adequacy Guide and Evaluation Standard (IMAGES).
9. TOP 7-3-501, Personnel Training.
10. TOP 1-2-610, Human Factors Engineering.
11. TOP 7-3-527, Internal/External Lighting (Aviation Materiel).
12. TOP 7-3-506, Safety.
13. TECOM Regulation 70-24, Research and Development: Documenting Test Plans and Reports, w/changes 1 and 2.
14. TOP 7-3-500, Physical Characteristics (Aviation Materiel).
15. AR 750-25, w/TECOM Supplement 1, Army Metrology and Calibration System.
16. TOP 6-3-515, Reliable Communication Range.
17. TOP 6-3-514, Qualitative Frequency Accuracy and Stability.